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A GENERAL TECHNICIAN PROGRAM FOR DISADVANTAGED YOUTH.

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A 2-YEAR GENERAL TECHNOLOGY PROGRAM HAS BEEN PLANNED BY RUTGERS UNIVERSITY AND THE NEWARK SCHOOL SYSTEM AS A MEANS OF PREPARING DISADVANTAGED YOUTH TO ENTER GAINFUL EMPLOYMENT AND ENHANCE THEIR OPPORTUNITY TO IMPROVE THEIR STATION IN LIFE. THE STUDENTS WILL BE DEPRIVED AREA YOUTH WHO ARE HIGH SCHOOL GRADUATES OR THE EQUIVALENT, GENERALLY FROM THE LOWER HALF OF THE GRADUATING CLASS AND WITH FEW SKILLS. IT IS PLANNED THAT HALF OF THE PROGRAM WILL CONSIST OF SPECIALIZED TRAINING IN (1) MACHINE SHOP PRACTICE, (2) SELECTED TOPICS IN CHEMISTRY, (3) BASIC ELECTRICITY, (4) BASIC ELECTRONIC INSTRUMENTATION, (5) VACUUM TECHNOLOGY, (6) CRYOGENICS, (7) SELECTED TOPICS IN MATHEMATICS, AND (8) SELECTED TOPICS IN PHYSICS. THE REST OF THE PROGRAM WILL PROVIDE GENERAL EDUCATION AND COOPERATIVE WORK EXPERIENCE. THE WORK STUDY PHASE WILL PROVIDE THE STUDENT WITH (1) AN INCOME WHILE HE IS IN SCHOOL, (2) A SERIES OF SUCCESSFUL WORK EXPERIENCES TO INCREASE CONFIDENCE IN HIS ABILITY TO HOLD A JOB, AND (3) WORK EXPERIENCES RELATED TO HIS ACADEMIC PROGRAM. A SURVEY IN THE NEWARK AREA INDICATED THAT GRADUATES OF THE PROGRAM COULD FIND EMPLOYMENT AND THAT THE COOPERATIVE WORK PROGRAM WOULD BE WIDELY ACCEPTED. THIS PAPER WAS PRESENTED AT THE ANNUAL MEETING OF THE AMERICAN SOCIETY FOR ENGINEERING EDUCATION (MICHIGAN STATE UNIVERSITY, EAST LANSING, JUNE 19-22, 1967). (WO)

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A GENERAL TECHNICIAN PROGRAM FOR DISADVANTAGED YOUTH

UNIVERSITY OF CALIF.
LOS ANGELES

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Abstract

This paper deals with the design of a general technician program for disadvantaged youth of Newark, New Jersey. The program described here is one part of a proposed pilot-demonstration project for that city. The establishment of a climate in which disadvantaged post-secondary youth can be given increased opportunities to become reasonably happy and productive citizens is the overall objective of the project. The General Technician program discussed in this paper is one of three programs for that project.

The proposed General Technician curriculum differs in a number of ways, including: a) adoption of a broad base curriculum covering eight subject areas; b) provision of an intensive program of ongoing evaluation of program, students and instruction; c) cooperative work experiences for the entire two years.

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During the past academic year, Rutgers - The State University and the Board of Education of Newark, New Jersey, have been involved in a joint project aimed at improving the educational opportunities for the disadvantaged youth of that city. This cooperative venture is entitled "Design for Urban Education" and has been recently funded for continued operation. The Director of the project is Dr. Maurie Hillson, Professor of Education from the Graduate School of Education at Rutgers - The State University. One part of this project is the design of a community college demonstration program for the youth of the deprived areas in Newark. This writer was requested by the Design for Urban Education Project to design the community college demonstration program.

The overall project that has been designed, has as its overall purpose, to provide three programs in post-secondary education for the youth in the hard-core poverty districts of Newark, New Jersey. The three curriculums are: 1. General Technician Program, 2. Social Welfare Technician Program, 3. Liberal Arts Transfer Program.

This paper is primarily concerned with the General Technician Program. Because the students are in the "poor now" category, the General Technician program will include a generous amount of cooperative work experiences with industry in the greater Newark area. The cooperative work portion of the program, which will run for the entire two years for each student, will also provide the students with a vital link between their education and the world of work. Therefore,

the cooperative work activities will serve several very important functions at one time: (1) Provide a means to earn an income, (2) To associate their educational experiences with the world of work, and (3) To establish some degree of self-confidence.

This program is designed for deprived area youth who either have graduated from secondary school or have the equivalent educational experience. They will, for the greater part, come from the lower half of their graduating class and will have taken the general curriculum in high school. They will have few, if any, skills that are marketable in the world of work and would more likely than not be destined to spend at least half of their working years being unemployed and probably on the relief rolls. This project will hopefully prepare these youth to enter permanent gainful employment upon graduation for the general technician program. It is hoped that each youngster will be given a greatly enhanced possibility of improving his own station in life. Therefore, this pilot project has as its prime objective to identify and help certain deprived youth to overcome some of the severe disadvantages confronting them.

An intensive counseling service incorporating the use of a sociologist, psychologist, and a guidance counselor will be provided for each student prior to his entrance into the program. The expertise of these key individuals, coupled with the utilization of certain selected psychological instruments and achievement tests, will serve as the basis for identifying some of the characteristics of

each student. The information derived from the counseling-interview activities will be used in ascertaining the starting point in the education of that student. By maintaining a low student-teacher ratio, a high degree of individualization of instruction will be provided. In this way, it is believed that the possibility of fostering, maintaining, and improving student motivation will be substantially enhanced.

The work study portion of the program will serve several very important purposes: (1) To provide the student with an income while enrolled in the program. Inasmuch as the great majority of these students will have no means of support, the provision of an income is of primary importance. (2) To provide the student with a series of successful work experiences that will build up confidence in his ability to hold a job. Because of the fact that their previous experiences in the occupational area is either nonexistent or negative in nature, it is deemed essential that they be guided into and through a work experience that is successful from their personal point of view. It should enable them to prove to themselves that they are capable of holding down a job with success and personal satisfaction. (3) To provide the student with work experiences that relate to his academic program. Because these students have relatively short-term objectives, it becomes very important that they be capable of identifying a realistic connection between their academic program and their work experiences. In this way, the "on-the-job" part of their education also becomes an integral factor in continuous student motivation.

It is of greatest urgency that the Director, faculty, and staff of this community college activity be psychologically suitable for

the type of student body to be served. Individuals who feel sufficiently secure so as to be able to consider non-traditional approaches and methods in their interactions with these hard-core poverty type students must be recruited into the faculty. The most central qualifying characteristic - along with that just mentioned - is that the Director, faculty, and staff members earnestly believe in the worthwhileness of educating this type of student. The Director should be an outstanding innovator, as well as a leader, in the area of urban-type community college education.

Special attempts should be made to secure a Director who, along with being particularly sensitive to the needs and characteristics of this special segment of the youth population, must also be alert to the tendency for the academic type program to be considered more worthwhile than the non-academic offerings. This trend has been uncovered in a number of instances, including a joint study by Rutgers - The State University and Pennsylvania State University that was recently completed (1). The Director must be capable of taking the appropriate measures to minimize this non-constructive tendency whenever it appears.

The so-called "specialization" portion of the general technician program will be sufficiently broad so as to provide a rich foundation for the many specific jobs that exist in that technician area. Specific training for specialized tasks will take place as a normal part of the work-study portion of the program. In this way, the background of each student will be made sufficiently broad in the

cognitive powers to enable him to move through several job changes brought on by the rapid changes in technology while he also obtains specific on-the-job training at the same time. The importance of this feature of the program has been stressed by many authorities in the literature. Grant Venn (2, pp. 6-7) expressed it in this manner: ". . . the advent of the new technology has led us into a further stage of work activity in which the emphasis on manipulative powers has shifted to emphasis on the cognitive powers . . .the shift from manual to cognitive work is reflected in the long-term changes in the occupational distribution of the labor force . . ."

The general education portion of the general technician program should represent a radical departure from the traditional treatment of this area of study. This aspect of the occupational programs is the part of the students' education that should have the greatest lasting value in a most positive sense. General education for these students should be oriented around the problems they have lived with up to that point in time and will be living with in the forseeable future. These types of problems tend to take on a non-academic tone and, therefore, are shied away from by the traditional unimaginative educator who prefers the safety of conservative academia over the unsettled nature of creative problem-solving type teaching. The general education for the poverty-type youth of this project could include a wide variety of subject areas that are of great importance and concern to him, such as: sanitation, water pollution, air pollution, civic participation, community action, housing, transportation,

industry, business, the role of governments (local, state and federal) and the police, etc. The contention here is that providing these students with the general skills and knowledges associated with the topics mentioned above is in actuality providing them with a true preparation for living. Their abilities to communicate (which should include learning how to imagine, analyze, formulate, interpret, and convey thought), the knowledge and know-how they acquire in the college's broad social science area will go with these students from college to home, home to job, job to job, and from city to city. While they may expect to change occupations at least several times during their working life span, their needs in the communicative-socio-civic area will be met in a natural fashion from the fundamentals provided in the new type of community college general education program proposed for this project.

The preceding statements relative to the general education portion of the curriculum clearly points out that the general education courses will not be the type of academic courses to be made available to the liberal arts transfer students. This dichotomy should be recognized early and each type of offering respected for its own objectives. While the same general education offerings can be offered to the Social Welfare Technician students and to the General Technician students, these courses will not be taken from the liberal arts transfer program.

The specific objectives of this project that directly relate to the general technician are:

1. To establish a community college type setting that is conducive to learning for the type of youth to be enrolled in the programs.
2. To develop effective methods of identifying those deprived-area youth that would benefit from the programs to be offered.
3. To prepare poverty-area youth for work in the general technician area.
4. To conduct an ongoing-longitudinal type evaluation of each program, student, and instructor with a constant eye on improvement for the benefit of this special type of student.
5. To offer a unique type of general education for those enrolled in the occupational programs that will be of true meaning for them in their "here and now" environment.

The national need for workers in the technician job category has been established in the literature. A National Science Foundation Study (3, p. 8) has found that a seventy per-cent increase in the required number of technicians during the decade from 1960 to 1970 can be expected. This same study (3, p. 27) also pointed out that many of the technician positions are being filled by individuals who have had very little or no technician type education. The last statement is just one indication that lower level technicians are in great demand by industry. Other studies that support the belief that

lower-level technicians are needed are as follows: Gillie (4), Wayne State University (5), Long Beach State College (6), and Bent (7).

The local and regional need for the General Technician was determined by establishing direct contact with certain key individuals and industries in the New Jersey community. In order to determine what, if any, need did exist, a generalized outline of the overall curriculum was designed. This was done with the assistance of several industrialists, particularly from the David Sarnoff Research Laboratories in Princeton, New Jersey.

The proposed specialized portion of the curriculum, which would be about 50 per cent of the entire program, would include:

1. Machine Shop Practice:

   Operating instructions for the drill, lathe, bandsaw, grinder, and torch. Techniques for cutting various types of metal. The use of associated measuring instruments (such as the micrometer, caliper, scaler). Use of the bending brake, sander, shear. Ability to use both metric (cgs and mks) and English units. To know the precautions to be taken when using the machines listed above.

2. Selected Topics in Chemistry:

   A general knowledge of acids, solvents and alkali bases. The major emphasis will be on precautions and techniques for handling these materials. Some analysis of Vapors. Use of analytical balances.

3. Basic Electricity:

A practical course on the fundamentals of ds and ac. Some general transformer work (at least to distinguish between step-up and step-down transformers).

4. Basic Electronic Instrumentation:

Heavy emphasis on the use of certain basic instruments including:

Microscopes

Oscilloscopes

Voltmeters

Ammeters

Ohmeters

X-y recorders

Bridges (for circuit balancing)

Frequency Meters (oscillators)

Special attention given to spectrum analysis including a good treatment of frequency and wavelength.

Treatment of integrated circuits (what they are) and transistors (how they work). No work on amplifiers will be included.

5. Vacuum Technology:

Knowledge on how to operate the mechanical pump, diffusion pump, deposition (the process of evaporation of metals). Familiarity with the following types of heating: electron beam, resistance and inductive. Knowledge of cold traps, various sub-strates (such as ceramics, glasses). The

reading and measurement of vacuums. Know how to measure deposits of metals.

6. Cryogenics:

The characteristics of temperature. Fundamentals of heat flow downhill. Knowledge of the temperature scales and conversions between them. Heavy emphasis on demonstration and laboratory performance - a practical approach throughout.

7. Selected Topics in Mathematics:

Review of the fundamentals of arithmetic (addition, subtraction, multiplication, division, fractions, decimals, percentages). Introduction and review of general mathematics, simple linear equations, algebraic processes, the slide rule, elementary topics in geometry and trigonometry. Scientific notation will be stressed in conjunction with the use of the slide rule.

All topics in mathematics will be related to the technical subjects being taught at the same time or that will follow shortly. The related approach to the mathematics with heavy emphasis on practical applications will be stressed.

8. Selected Topics in Physics:

Units of measurement (including mks, cgs, fps, frequency, wavelengths). Principles of current flow (from which will come the concepts of current flow in metals, solutions, and

semiconductors). The concepts of solids, liquids, and gases. Some practical theory on how the vacuum pump works. Some practical principles of magnetism and electromagnetism. A practical treatment of temperature measurements and the relationship between temperature and the behavior of certain materials. Light (ultra-violet and infrared) principles. A few selected concepts on photosensitivity.

The remainder of the program will be devoted to general education and the cooperative-work activities.

The next step in determing the magnitude of the need for General Technicians was to contact the New Jersey State Employment Service with a request that they consider the prospect of conducting an industrial survey. The New Jersey State Employment Service agreed to conduct the survey among selected industries in the greater Newark area.

The nature of the questionnaire was such that the respondents were asked to assign a value to each of the eight curriculum areas just described, in terms of the kind of technician needed by them. The responses of those who stated they would hire such a technician point to high values assigned to six of the eight topics (Machine Shop Practice, Selected Topics in Chemistry, Basic Electricity, Basic Electronics Instrumentation, Selected Topics in Mathematics, and Selected Topics in Physics). Relative low values were assigned to Vacuum Technology and Cryogenics. This would indicate that these

two topics should be assigned only a very limited amount of time (if any at all) in the program. The next step in the evaluation of the overall curriculum is to establish a special advisory committee to further evaluate the topics, particularly in light of the survey results.

A total of 25 industrial firms in the greater Newark area indicated an interest in hiring the graduates of the general technician program. Furthermore, these same firms stated they would be willing to engage in cooperative work programs for about fifty students. Twenty-five other industries, who indicated they did not have positions requiring this type of technician, expressed a willingness to enter into cooperative work programs for about forty students. Therefore the survey showed that selected industries in greater Newark would be willing to place almost 100 students in cooperative work programs. This was considered to be very encouraging since the proposed initial general technician program is to be limited to 50 students.

Conclusions:

It should be emphasized that the program described in this paper includes provisions for careful identification of students, cooperative work experiences that begin immediately upon enrollment, and intensive ongoing evaluation of curriculum, instruction, and students. It is designed to be a pilot demonstration project with a maximum amount of flexibility so as to permit changes in physical

arrangements and instructional activities as deemed desirable by the continuous evaluation process.

Although the specific program discussed in this paper has been designed for disadvantaged youth, this writer feels it can be readily adapted to a typical urban cummunity college setting with relatively minor changes. It is hoped that this general technician program can be inaugurated in an urban community college on an experimental basis within the next year or two. Many of us in occupational education have become, or are in the process of becoming, advocates of multi-level occupational curriculums in the community colleges. We believe the criteria for establishing community college programs has nothing to do with the academic level of the program - if there are post-high school age people who can profit from a particular program then it should be offered by the community college. We hope this belief becomes more widespread, therefore permitting the community colleges to become an even more viable instrument for preparing people to function successfully in our society.

ADDENDUM I

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5. Wayne State University and Norman G. Laws. Mathematical Expectations of Technicians in Michigan Industries. Department of Public Instruction, Detroit, Michigan (1966).

6. The results of this study were cited by Simons, Jerold J. "Electronics Technicians - The Math Concepts They Need." An article in School Shop (Sept. 1966). Ann Arbor: Prakken Publications, 1966.

7. Bent, Ralph D. "Technicians in the Electronics and Aerospace Industries." An article in Technical Education News (March 1965). New York: McGraw-Hill Book Company, Inc., 1965.

ADDENDUM II

GENERAL TECHNICIAN SURVEY

The enclosed outline describes the content of eight areas which are proposed for the training of the General Technician. Would you indicate the value of the material suggested in each area in terms of the technicians needed by the industry you represent? The scale of values are as follows:

3 - essential	1 - of some value
2 - important	0 - unrelated or no value

Use "X" to indicate the value you wish to assign to each topic.

(1)	Machine Shop Practice	3_	2_	1_	0_
(2)	Selected Topics in Chemistry	3_	2_	1_	0_
(3)	Basic Electricity	3_	2_	1_	0_
(4)	Basic Electronics Instrumentation	3_	2_	1_	0_
(5)	Vacuum Technology	3_	2_	1_	0_
(6)	Cryogenics	3_	2_	1_	0_
(7)	Selected Topics in Mathematics	3_	2_	1_	0_
(8)	Selected Topics in Physics	3_	2_	1_	0_

II. Would you be willing to enter into a cooperative work-study arrangement with those technician students?

yes _____ no _____

If yes, with about how many? _____

GENERAL TECHNICIAN SURVEY (CONTINUED)

III. Please indicate below the job titles in your company for which these trainees might be utilized and the estimated numbers.

Job Title(s)	Current Vacancies	Number of Persons Needed		Opening Salary
		6 Months	12 Months	

Comments:

Firm Name: _____

Signature: _____

Date: _____

Note:

We would appreciate receiving the information sought within three weeks from the date of our request.